
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT

In re application of: Michael Neal et al.

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PROMOTION EVENT CALENDER

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APPEAL BRIEF UNDER 37 C.F.R. 41.37

Further to Notice of Appeal filed in this application on April 9, 2009, this Appeal Brief is being submitted to the Board of Patent Appeals and Interferences.

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Dear Sirs:

Appellants hereby appeal the decision of the primary examiner mailed December 9, 2008. The Appeal Board is thanked for their review of the application.

I. REAL PARTY IN INTEREST

The real party in interest is DemandTec Corporation, a corporation of the state of Delaware, the assignee of all rights, title and interest in the present application from applicants Michael Neal, Krishna Venkatraman, Rob Parkin, Suzanne Valentine, Phil Delurgio and Hau Lee recorded in the United States Patent and Trademark Office, at Reel/Frame 011991/0016.

II. RELATED APPEALS AND INTERFERENCES

Based upon information and belief, there are no appeals or interferences that could directly affect or be directly affected by or have a bearing on the decision by the Board of Patent Appeals and Interferences in the pending appeal.

III. STATUS OF THE CLAIMS

The final rejection of Claims 1-17 and 19-36 is being appealed. These appealed claims are reproduced in the Claims Appendix hereto. Status of the claims is as follows:

- a) Claims 1-17 and 19-36 have been rejected.
- b) Claim 18 has been previously cancelled.
- c) All rejected claims 1-17 and 19-36 are being appealed.

IV. STATUS OF THE AMENDMENTS

No amendment has been filed since the mailing on December 9, 2008 of the final Office Action herein.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

A. Regarding Independent Claim 1

The appealed independent Claim 1 relates to the pricing of products for retailers and wholesalers. (page 2, lines 15-18). Proper pricing of goods and services is integral to the success of a business. As such, pricing systems, including price optimization systems, are highly valued by businesses and fulfill an important role in business decision making and planning.

Claim 1 of this application addresses an apparatus for generating a promotional event calendar. (page 4, lines 10-20). This apparatus is unique in that sales models, which are used to generate the promotion calendar, are generated for **demand groups** of products. (page 18, lines 3-21; page 57, lines 1-9). These demand grouping categories are groupings of highly substitutable products. (page 18, lines 7-9).

Furthermore, the present invention discloses the use of an “equivalent price and an equivalized unit for each product” for the generation of the sales model. (page 19, lines 1-23).

Thus, the apparatus is capable of generating the sales model, and thus the promotional event calendar, using demand groups for reduced processing demands. (page 18, lines 3-21).

The benefit of generating the product sales model in this fashion is that the invention sidesteps the need to generate sales models for each individual product, but rather generates sales data for a lesser number of demand groups. Demand group level sales models provide much more robust estimates of sales despite changes in assortments and product level trends such as seasonality. The product level sales models may be combined with market share models, which are very robust in estimating relative shares and relative product-substitution elasticities. These

multi-level models enable the system to effectively share information between products to generate better demand estimates.

The sales model along with a cost model may then be used to aid analysis of the plurality of promotion events, constraints, offers to generate the promotional event calendar.

Other systems require generating sales models for each product. This may be extremely costly in terms of time and computing resources. As such, the present invention provides a dramatic improvement over prior promotion event planning systems.

In particular, Claim 1 states:

“A computerized price optimization system configured to create a promotional event calendar” See the specification as filed at page 4, lines 16-21; Figure 21, part 2100.

“useful in association with at least one store,” See the specification as filed at page 130, lines 10-12; Figure 21, part 2124.

“the computerized price optimization system comprising:” See the specification as filed at page 129, lines 8-11; Figure 21, part 2100.

“an econometric engine including computer-readable code configured to model sales as a function of price to create a sales model,” See the specification as filed at page 74, lines 5-7; page 129, lines 14-29; Figure 21, part 2104.

“wherein the econometric engine includes an imputed variable generator for:” See the specification as filed at page 13, lines 8-10; Figure 3, part 304.

“imputing base price variable and promotional variable,” See the specification as filed at page 30, lines 1-3; page 52, lines 10-17; Figure 12A, part 1205; and Figure 19A part 1903.

“creating a plurality of demand groups, wherein each demand group is a set of at least one product and wherein at least one of the demand groups is a set of at least two substitutable products,” See the specification as filed at page 18, lines 5-9; Figure 10, part 1023.

“and wherein the creation of the plurality of demand groups includes error detection and correction based on attributes of the plurality of demand groups,” See the specification as filed at page 18, lines 9-20; Figure 10, parts 1019 and 1021.

“generating an equivalent price and an equivalized unit for each product of the plurality of demand groups using an equivalizing factor, and” See the specification as filed at page 19, lines 1-13; Figure 10, part 1025; and Figure 13, parts 1301 and 1303.

“wherein the sales model includes the imputed base price variable, the equivalent price, the equivalent unit and the promotional variable;” See the specification as filed at page 64, line 14 to page 68, line 15; Figure 2, part 208.

“a financial model engine including computer-readable code configured to model costs to create a cost model;” See the specification as filed at page 75, lines 1-5; Figure 21, part 2108.

“a promotional engine coupled to the econometric engine, and financial model engine, the promotional engine including computer-readable code configured to receive input from the econometric engine and financial model engine,” See the specification as filed at page 124, lines 10-15; Figure 21, part 2112.

“wherein the promotional engine analyzes a plurality of offers, a plurality of promotional events, conditions from at least one manufacturer, and constraints from the at least one store to optimally match offers with promotional events to create a promotional event calendar subject to the conditions from the at least one store,” See the specification as filed at page 130, lines 16-21; Figure 23, parts 2326 and 2332.

“and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint.” See the specification as filed at page 126, lines 10-22; page 151, line 10 to page 155, line 2; Figure 24, part 2404.

B. Regarding Independent Claim 5

As with Claim 1, Independent Claim 5 relates to the pricing of products for retailers and wholesalers. (page 2, lines 15-18). Claim 5 of this application addresses a method for generating a promotional event calendar. (page 4, lines 10-20). This method is unique in that sales models, which are used to generate the promotion calendar, are generated for demand groups of products (i.e., groupings of highly substitutable products). (page 18, lines 3-21; page 57, lines 1-9). Furthermore, the present invention discloses the use of an “equivalent price and an equivalized unit for each product” for the generation of the sales model. (page 19, lines 1-23).

In particular, Claim 5 states:

“A computer-implemented method for creating a promotional event calendar, comprising:” See the specification as filed at page 4, lines 10-15; Figure 23, part 2332.

“creating a plurality of demand groups, wherein each demand group is a set of at least one product and wherein at least one of the demand groups is a set of at least two substitutable products,” See the specification as filed at page 18, lines 5-9; Figure 10, part 1023.

“and wherein the creation of the plurality of demand groups includes error detection and correction based on attributes of the plurality of demand groups,” See the specification as filed at page 18, lines 9-20; Figure 10, parts 1019 and 1021.

“generating an equivalent price and an equivalized unit for each product of the plurality of demand groups using an equivalizing factor,” See the specification as filed at page 19, lines 1-13; Figure 10, part 1025; and Figure 13, parts 1301 and 1303.

“creating a sales model for each demand group” See the specification as filed at page 61, lines 5-15; Figure 23, part 2308.

“wherein the sales model includes the imputed base price variable, the equivalent price, the equivalent unit and the promotional variable;” See the specification as filed at page 64, line 14 to page 68, line 15; Figure 2, part 208.

“creating a cost model;” See the specification as filed at page 75, lines 1-5; Figure 23, part 2320.

“determining conditions from at least one manufacturer;” See the specification as filed at page 128, lines 20-21; page 130, lines 10-12; Figure 23, part 2326.

“determining constraints from at least one store,” See the specification as filed at page 126, lines 10-22; page 130, lines 10-12; Figure 23, part 2326.

“and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint;” See the specification as filed at page 151, line 10 to page 155, line 2; Figure 24, part 2404.

“determining the value of offers using the sales model and cost model;” See the specification as filed at page 130, lines 16-21; page 147, lines 1-5; Figure 24, part 2404.

“determining the value of promotional events using the sales model and cost model; and” See the specification as filed at page 130, lines 16-21; page 131, lines 4-20; Figure 24, part 2404.

“selecting combinations of the offers and promotional events based on the determined values to create a promotion event calendar subject to the conditions from the at least one manufacturer and constraints from the at least one store.” See the specification as filed at page 130, lines 16-21; Figure 23, parts 2326 and 2332.

C. Regarding Independent Claim 8

As with Claim 5, Independent Claim 8 of this application addresses a method for generating a promotional event calendar. (page 4, lines 10-20). This method is unique in that sales models, which are used to generate the promotion calendar, are generated for **demand groups** of products (i.e., groupings of highly substitutable products). (page 18, lines 3-21; page 57, lines 1-9). Furthermore, the present invention discloses the use of an “equivalent price and an equivalized unit for each product” for the generation of the sales model. (page 19, lines 1-23).

In particular, Claim 8 states:

“A computer-implemented method for creating a promotional event calendar, comprising:” See the specification as filed at page 4, lines 10-15; Figure 23, part 2332.

“creating a sales model for each demand group” See the specification as filed at page 61, lines 5-15; Figure 23, part 2308.

“creating a plurality of demand groups, wherein each demand group is a set of at least one product and wherein at least one of the demand groups is a set of at least two products,” See the specification as filed at page 18, lines 5-9; Figure 10, part 1023.

“generating an equivalent price and an equivalized unit for each product of the plurality of demand groups using an equivalizing factor,” See the specification as filed at page 19, lines 1-13; Figure 10, part 1025; and Figure 13, parts 1301 and 1303.

“creating a sales model for each demand group and wherein the sales model for each demand group includes an imputed base price variable, the equivalent price, the equivalent unit and a promotional variable; and” See the specification as filed at page 64, line 14 to page 68, line 15; Figure 2, part 208.

“creating a market share model for each product in each demand group;” See the specification as filed at page 72, lines 3-7; Figure 2, part 208.

“creating a cost model;” See the specification as filed at page 75, lines 1-5; Figure 23, part 2320.

“determining conditions from at least one manufacturer;” See the specification as filed at page 128, lines 20-21; page 130, lines 10-12; Figure 23, part 2326.

“determining constraints from at least one store,” See the specification as filed at page 126, lines 10-22; page 130, lines 10-12; Figure 23, part 2326.

“and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint;” See the specification as filed at page 151, line 10 to page 155, line 2; Figure 24, part 2404.

“determining the value of offers using the sales model and cost model;” See the specification as filed at page 130, lines 16-21; page 147, lines 1-5; Figure 24, part 2404.

“determining the value of promotional events using the sales model and cost model; and” See the specification as filed at page 130, lines 16-21; page 131, lines 4-20; Figure 24, part 2404.

“selecting combinations of the offers and promotional events based on the determined values to create a promotion event calendar subject to the conditions from the at least one manufacturer and constraints from the at least one store; and” See the specification as filed at page 130, lines 16-21; Figure 23, parts 2326 and 2332.

“estimating net profit from the selected combination of offers and promotional events using the sales model and cost model.” See the specification as filed at page 168, lines 13-14; Figure 24, parts 2408.

D. Regarding Independent Claim 28

As with Claims 5 and 8, Independent Claim 28 of this application addresses a method for generating a promotional event calendar. (page 4, lines 10-20). This method is unique in that the present invention discloses the use of an “equivalent price and an equivalized unit for each product” for the generation of the sales model. (page 19, lines 1-23).

In particular, Claim 28 states:

“A computer-implemented method for creating a promotional event calendar,” See the specification as filed at page 4, lines 10-15; Figure 23, part 2332.

“useful in association with at least one store, the computer-implemented method comprising:” See the specification as filed at page 130, lines 10-12; Figure 21, part 2124.

“modeling sales as a function of price to create a sales model,” See the specification as filed at page 61, lines 5-15; Figure 23, part 2308.

“wherein the sales model includes imputing base price variable and promotional variable, and generating an equivalent price and an equivalized unit using an equivalizing factor;” See the specification as filed at page 64, line 14 to page 68, line 15; Figure 2, part 208.

“modeling costs to create a cost model;” See the specification as filed at page 75, lines 1-5; Figure 23, part 2320.

“receiving cost model and sales model;” See the specification at page 124, lines 10-15; Figure 23, parts 2312 and 2324.

“analyzing a plurality of offers, a plurality of promotional events, conditions from at least one manufacturer, and constraints from the at least one store; and” See the specification as filed at 126, lines 10-22; page 128, lines 20-21; page 130, lines 10-21; page 131, lines 4-20; page 147, lines 1-5; Figure 23, part 2326; and Figure 24, part 2404.

“creating a promotional event calendar by optimally matching offers with promotional events.” See the specification as filed at page 130, lines 16-21; Figure 23, parts 2326 and 2332.

E. Regarding Dependent Claims 2-4, 6-7, 9-17, 19-27 and 29-36

Claim 2 states “wherein the promotional engine further comprises a temporary price reduction optimizing engine including computer-readable code configured to temporarily reduce prices after the promotional events and offers have been selected.” See the specification as filed at page 166, lines 11-15.

Claim 3 states “further comprising a support tool connected to the promotional engine wherein the support tool including computer-readable code configured to receive the

promotional event calendar from the promotional engine and provides a user interface to a client, wherein the user interface provides the promotional event calendar to the client.” See the specification as filed at page 124, lines 9-20; Figure 21, part 2116.

Claim 4 states “wherein the promotional engine calculates the value of offers and the value of promotional events by using the financial model and sales model and selects combinations of the offers and the promotional events.” See the specification as filed at page 130, lines 16-21; page 131, lines 5-16; Figure 21, part 2116.

Claim 6 states “wherein the creating of the sales model further comprises: creating a market share model for each product in each demand group.” See the specification as filed at page 72, lines 3-7.

Claim 7 states “further comprising the step of estimating net profit from the selected combination of offers and promotional events using the sales model and cost model.” See the specification as filed at page 167, lines 19-21.

Claims 9, 11 and 13 state “wherein the constraints from the at least one store include at least one of ad space capacity and display space capacity.” See the specification as filed at page 126, lines 10-15.

Claims 10, 12 and 14 state “wherein the constraints from the at least one store include at least one of an event type, a number of events, a brand promotion frequency, and a product promotion frequency.” See the specification as filed at page 140, line 1 to page 148, line 3.

Claims 15, 16 and 17 state “wherein the matching of offers with promotional events includes solving an integer problem using the linear constraint and the nonlinear constraint.” See the specification as filed at page 140, line 1 to page 148, line 3.

Claims 19, 21 and 23 state “wherein the conditions from the at least one manufacturer include providing at least one of a promotional event and a specific amount of promotion.” See the specification as filed at page 129, lines 1-7.

Claims 20, 22 and 24 state “wherein the conditions from the at least one manufacturer include not providing a promotional event for a competitor’s product.” See the specification as filed at page 129, lines 1-7.

Claim 25 states “wherein the imputed base price variable is a function of initial base prices.” See the specification as filed at page 30, lines 3-7.

Claim 26 states “wherein the initial base prices are averages of non-promoted prices.” See the specification as filed at page 31, lines 7-18.

Claim 27 states “wherein the econometric engine utilizes Bayesian Shrinkage modeling which relies on a mixed-model methodology of combining data to dampen any extreme values of the data.” See the specification as filed at page 61, lines 15-20.

Claim 29 states “wherein creating the promotional event calendar is subject to the conditions from the at least one store, and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint.” See the specification as filed at page 140, line 1 to page 148, line 3.

Claim 30 states “wherein creating the promotional event calendar comprises: computing a score for each offer of the plurality of offers and each event of the plurality of promotional events, wherein each event include at least one type of promotional vehicle, and wherein each offer includes at least one promotional vehicle requirement; selecting a combination of offers from the plurality of offers, and events from the plurality of promotional events to form a subset of offers and events; reconciling the type of promotional vehicle with the promotional vehicle requirements for the offers and events within the subset of offers and events; and constructing a promotion calendar utilizing the subset of offers and events, and reconciled type of promotional vehicle and promotional vehicle requirements.” See the specification as filed at page 131, line 4 to page 134, line 7.

Claim 31 states “wherein the computing the score independently computes a value of each offer and a value of each event, and wherein the computing the score also links each

product with one promotional vehicle type of the at least one promotional vehicle type.” See the specification as filed at page 131, lines 4-16.

Claim 32 states “wherein selecting the combination of offers and events includes maximizing the sum of the values of the offers and events within the subset of offers and events, while adhering to the conditions from at least one manufacturer and the constraints from the at least one store.” See the specification as filed at page 133, lines 3-5.

Claim 33 states “wherein reconciling the type of promotional vehicle with the promotional vehicle requirements includes solving an integer problem.” See the specification as filed at page 132, lines 8-10.

Claim 34 states “wherein constructing a promotion calendar includes setting the promotion levels of each product and computing the resulting profit over a promotional period.” See the specification as filed at page 134, lines 3-7.

Claim 35 states “wherein the selection subset of offers and events includes the integer programming model with the following objective function and appropriate restrictions on the variables:

$$\sum_{t=1}^T \sum_o Value_o IO_{o,t} + \sum_{t=1}^T \sum_e Value_{e,t} IE_{e,t}$$

where,

t : a time indices;

O : a set of offers;

o : an offer in O ;

E : a set of events;

e : an event in E ;

T : total planning period in weeks;

$IE_{e,t} \equiv \begin{cases} 1 & \text{if event } e \text{ is scheduled to start in period } t \\ 0 & \text{otherwise} \end{cases}$; and

$$IO_{o,t} \equiv \begin{cases} 1 & \text{if offer } o \text{ is accepted in period } t \\ 0 & \text{otherwise} \end{cases}.$$

See the specification as filed at page 134, line 19 to page 138, line 9; page 151, lines 6-10.

Claim 36 states “wherein the reconciliation includes the integer programming model with the following objective function and appropriate restrictions on the variables:

$$\text{Maximize: } \sum_{t=1}^T \left(\sum_{\substack{p,e: IE_{e,t}=1 \\ k \in \text{DisplayLag}(e)}} \text{Score}_p \text{IDE}_{p,e,t+k} + \sum_{\substack{p,e: IE_{e,t}=1 \\ k \in \text{AdLag}(e)}} \text{Score}_p \text{IAE}_{p,e,t+k} \right)$$

where,

t : time indices;

E : set of events;

e : event in E ;

p : index for products belonging to a set of promoted products;

$\text{DisplayLag}(e) \equiv \left\{ \begin{array}{l} \text{the offsets from the start of the event during} \\ \text{which the products have to be on display} \end{array} \right\};$

$\text{AdLag}(e) \equiv \left\{ \begin{array}{l} \text{the offsets from the start of the event during} \\ \text{which the products have to be advertised.} \end{array} \right\};$

T : total planning period in weeks;

$IE_{e,t} \equiv \begin{cases} 1 & \text{if event } e \text{ is scheduled to start in period } t \\ 0 & \text{otherwise} \end{cases};$

$\text{IDE}_{p,e,r} \equiv \begin{cases} 1 & \text{if product } p \text{ is on display in event } e \text{ in period } r \\ 0 & \text{otherwise} \end{cases};$

$\text{IAE}_{p,e,r} \equiv \begin{cases} 1 & \text{if product } p \text{ is advertised in event } e \text{ in time } r \\ 0 & \text{otherwise} \end{cases};$ and

r : any period in the promotion interval.”

See the specification as filed at page 134, line 19 to page 139, line 2; page 155, lines 1-3.

Appellants assert that all pending Claims 1-17 and 19-36 are novel and non-obvious over the cited art for all the reasons given below.

VI. GROUND OF REJECTION TO REVIEWED ON APPEAL

The Board is being asked to review the final rejection of Claims 5-8, 11-14, 16, 17, 21-24 and 28-36 under 35 U.S.C. 101. Also, the Board is being asked to review the final rejection of Claims 1-17 and 19-36 under 35 U.S.C. 103 as being unpatentable over Boyd et al. (US 7,072,848), in view of Dvorak (US 7,155,402) and in further view of LoPresti ("New SPSS Missing Value Analysis Option").

VII. REMARKS/ARGUMENTS

Appellants thank the Appeal Board for the review of this Appeal Brief. Appellants will now address the patentability of the present invention, with particular attention paid to the rejections made by the Examiner in response to the Amendment dated July 31, 2008, which is hereby incorporated by reference.

For the sake of clarity, Appellants have divided the arguments into various subsections; however, this is not intended to be limiting of the arguments contained therein. Thus, arguments in one subsection may be applied to all applicable subsections.

A. RESPONSE TO REJECTION OF THE CLAIMS UNDER 35 USC §101

Examiner rejected Claims 5-8, 11-14, 16, 17, 21-24 and 28-36 under 35 USC 101. Particularly, the Examiner stated that "based on Supreme Court precedent, and recent Federal Circuit decisions, § 101 process must (1) be tied to another statutory class (such as a particular apparatus) or (2) transform underlying subject matter (such as an article or materials) to a

different state or thing...In the present case, none of the method (process) claims transform subject matter to a different state or thing, or recite a sufficient tie to another statutory class of invention... (all system claims) are rejected under 35 U.S.C. 101 because it does not recite subject matter within one of the statutory classes.”

Appellants believe the Examiner mischaracterizes the base Claims 5, 8 and 28 in his rejection under 35 USC 101. In particular, Appellants believe that Claims 5, 8 and 28 are all tied to an apparatus as they are being “computer-implemented”. Thus, the process is tied to another statutory class and is an allowable process under 35 USC 101.

The Examiner, in his rejection, notes this tying to a computer; however, the Examiner disregards this, stating “[n]ominal recitation of a computer implemented method does not alone create a sufficient tie to a particular apparatus because all of the steps of the method may still be performed by a human, by hand, or by mental steps, or by using a computer for some nominal activity.” (Original Emphasis). However, Appellants note that it is well known by those skilled in the art of sales modeling for pricing optimization and promotion generation that vast quantities of data are collected and processed in order to generate accurate demand models. The sheer volume of data analyzed renders the task impossible for a human, or even large groups of humans, to perform by hand. Any situation where the volume of data and processing is reduced to levels that may be performed by humans would likewise reduce the quality of the models to such a degree that they would be unusable for predicting sales.

Thus, in this narrow field of sales modeling, in the manner claimed, the usage of a computer to perform data analytics is intrinsic. This, in conjunction with the recitation that the method is “computer implemented”, is believed sufficient to ‘tie’ the process with an apparatus. As such, Claims 5, 8 and 28 are believed allowable and in allowable form.

Furthermore, regarding each of Claims 5, 8 and 28, a “promotion event calendar” is “created”. Appellants believe that the creation of a promotion calendar is a positive ‘transformation’ of underlying subject matter. The promotion events calendar itself, be it a

hardcopy price printout or an electronic display of said calendar, is an article that has been generated (transformed) from raw data. This is a tangible and notorious physical transformation of a paper substrate, or electrical charges in a monitor. Moreover, invoices, price lists, databases, displays and ads are all transformed by the promotion event calendar. The amount of money generated by the business will also be altered by the promotion event calendar, which is an ancillary transformation.

Moreover, in the context of a computing system such as that described in some embodiments in the present specification, Appellants submit that a person of ordinary skill in the art would readily appreciate that practicable embodiments of the claimed invention would be conducted with the aid of a computing machine, such as a server. Such computing machines are commonly understood to have memory. Further, the operations recited in the claims clearly change the state of the underlying data since the cache, register, or other memory on which the data is stored must be transformed to have a different magnetic polarity, electrical charge, or the like depending on the technology that is used. These are real physical changes. Further, memory is a real physical article. As such, Appellants submit that the method claims perform a transformation under the “machine or transformation” test and thus qualify as patent-eligible subject matter.

In regards to the apparatus of Claim 5, and its dependent child claims, Appellants believe that the Examiner again mischaracterizes the scope and thrust of the claim. In particular, a series of ‘engines’ are disclosed in Claim 1. The Examiner jumps to the conclusion that “[e]ngines are portions of programs” and thus construes the claim as software per se. Appellants respectfully traverse this rejection in that claims are read in their broadest reasonable interpretation, and said “engines” may indeed include software, hardware or some combination of the two.

Moreover, even if one were to read the “engines” of Claim 1 to mean software only, there is mention that the system is “computerized” and “including computer-readable code”. Appellants believe that this is sufficient language to indicate that the program is being executed

by a computer, thereby rendering the invention a statutory class. As such, Claim 5 is also believed allowable for the above reasons.

B. RESPONSE TO REJECTION OF THE CLAIMS UNDER 35 USC §103

The examiner has additionally rejected pending Claims 1-17 and 19-36 under 35 U.S.C. 103 as being unpatentable over Boyd et al. (US 7,072,848), in view of Dvorak (US 7,155,402), in further view of LoPresti (“New SPSS Missing Value Analysis Option”).

Appellants believe that the present invention is nonobvious over Boyd, Dvorak and LoPresti because the cited references neither teach nor suggest each and every element of claim 1-17 and 19-36.

“A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *Graham v. John Deere Co.*, 383 U.S. 1, 13 (1966). Further, “[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.” *In re Royka*, 490 F.2d 981 (C.C.P.A. 1974); MPEP 2143.03.

Appellants believe that there is no basis for an obviousness rejection. In response to this rejection, Appellants will provide a brief discussion of the prior art and discuss the specific rejections of related claims below.

1. DISCUSSION AND CHARACTERIZATION OF THE CITED PRIOR ART

The main reference relied upon by the Examiner in the rejection of the present invention is Boyd et al. Boyd discloses “a system and method for assessing a proposed promotion scheme in view of desired business goals.” (Emphasis Added). (See Column 1, lines 15 to 18). Boyd further discloses analyzing the promotion via “market response models”. (See Column 2, lines

18-29). Thus, Boyd fails to generate a promotion calendar as claimed, but rather centers on the evaluation on promotions schemes that have already been generated. *Id.*

Dvorak, on the other hand, describes “adjusting a reference selling profile for a reference product” in order to determine product distributions to stores from a distributor. (See Column 1, lines 63-66; and Column 2, lines 41-51). In addition, Dvorak discloses a “Markdown Manager” capable of “creat[ing] an array of potential markdown scenarios, based on the allowed markdown levels and markdown dates.” (See Column 15, lines 56-67).

Lastly, LoPresti relates generally to “describe[ing] patterns of missing data”, “describe[ing] the data using univariate and multivariate statistics” and “creat[ing] a data set with imputed values for the missing data.” (See page 2, fourth full paragraph). LoPresti appears concerned primarily with data collected regarding a person, such as a survey. (See page 3, first full paragraph). In fact, such a data set generated by a survey appears required in the analysis provided by LoPresti in that the “responses” are split into “two groups.” *Id.* One group has missing data and the other does not. *Id.* Answers to the questions answered by both groups are compared for statistical differences to determine if the missing data is randomly distributed. (See page 2, last paragraph to page 3, first paragraph). Randomly distributed missing data may be dropped, while non random data is imputed via regression. (See page 3, second and third paragraphs).

2. NON-ANALOGOUS ART

Appellants believe that all of the cited art is non-analogous art, and is thus inappropriate for use as prior art. This argument is made in addition to the distinguishing arguments found below.

The court has found “the similarities and differences in structure and function of the inventions to carry far greater weight” in determining if references are analogous art. *In re Ellis*, 476 F.2d 1370, 1372, 177 USPQ 526, 527 (CCPA 1973). As previously discussed, LoPresti

teaches “describe[ing] patterns of missing data” and “creat[ing] a data set with imputed values for the missing data.” (See page 2, fourth full paragraph). Further, LoPresti appears concerned primarily with data collected regarding a person, such as a survey. (See page 3, first full paragraph).

Contrary, the present invention discloses **generation of sales models for a product given a demand group for the purpose of generating promotion event calendars**. See the Specification as filed at page 4, lines 10-15.

There appears no suggestion in LoPresti of being related in any way to price optimization, promotion event planning, or sales model generation. In fact, Appellants believe that the only similarity between LoPresti and the present invention is the fact that LoPresti includes the term “imputed”; however, this is the apparent end of any similarities. Even the data imputed in LoPresti (survey style raw data) differs from the “base price variable and promotional variable” that is imputed by the present invention. As such, rejections to Claims 1-17 and 19-36 are believed moot, and Claims 1-17 and 19-36 are believed allowable.

3. REGARDING BASE CLAIMS 1, 5, 8 AND 28

Claims 1, 5, 8 and 28 have been rejected by the examiner in light of Boyd et al. (US 7,072,848), in view of Dvorak (US 7,155,402), in further view of LoPresti (“New SPSS Missing Value Analysis Option”). As Claims 1, 5, 8 and 28 are all base claims of similar thrust Appellants have provided the arguments common to these claims together for the sake of clarity.

Appellants believe the rejections to these claims are erroneous and unfounded. Below is a listing of arguments where Boyd, Dvorak and LoPresti are contrasted with the Claimed invention. It will become clear that Boyd, Dvorak and LoPresti do not make the present invention obvious in that they differ greatly in regard to scope, breadth, thrust and means of accomplishing their respective objectives.

i. Boyd Fails to Suggest Analyzing Manufacturer Conditions

The Examiner rejected Claims 1, 5, 8 and 28 stating “Boyd et al. teaches ...analyzing a plurality of **offers** ... **conditions** from at least one manufacturer... See also column 11, lines 60-67, column 14, lines 20-40, column 17, lines 10-30 and line 58, and column 20, lines 24-30, which discloses constraints at stores and manufacturers).” (Emphasis Added).

Appellants believe that Boyd discloses a number of constraints that the “user” (i.e., store) is able to configure; however, there is a definite lacking of a suggestion of manufacturer conditions. (See Column 14, lines 20-43; and Column 17, lines 10-30).

The Examiner in support for his rejection appears to believe an example where a manufacturer has “three types of incentives offered” is an example of manufacturer “conditions” as claimed. (See Column 20, lines 23-25). Appellants believe this is a mischaracterization of Boyd, as these offered incentives are “offers” as claimed, not “conditions” as claimed.

Thus, the analyzing of manufacturer conditions as claimed is simply not found in Boyd. Base Claims 1, 5, 8 and 28 is believed allowable for at least these reasons. As such, Claims 2-4, 6-7, 9-17, 19-27 and 29-36, which depend therefrom, are likewise believed allowable for depending upon an allowable parent claim.

ii. Dvorak Fails to Suggest Creating a Promotion Event Calendar

The Examiner also rejected Claims 1, 5, 8 and 28 stating “Dvorak teaches creating a promotional event calendar for the chosen promotional, events (See column 3, lines 20-30, column 4, line 63-column 5, line 15, column 11, lines 40-55, which discloses a promotional event causal calendar displaying promotional events).”

Appellants agree that Dvorak sets up a “causal event calendar” from the “historical information” to “identify which promotional events occur”. (See Column 3, lines 19-25; and Column 4, lines 63-65). However, Appellants believe the Examiner mischaracterizes the ‘causal event calendar’ when rejecting Base Claims 1, 5, 8 and 28. Particularly, the “causal event

calendar” of Dvorak is reactive to historic and future promotions. The existence of a planned promotion leads to the event being identified within the causal event calendar. In contrast, the claimed “promotion event calendar” schedules times, descriptions and locations for promotional events. This is the exact opposite of the causal event calendar of Dvorak.

Given that the ‘causal event calendar’ of Dvorak does not teach or suggest the claimed ‘promotional event calendar’, Base Claims 1, 5, 8 and 28 are believed allowable for at least these reasons. As such, Claims 2-4, 6-7, 9-17, 19-27 and 29-36, which depend therefrom, are likewise believed allowable for depending upon an allowable parent claim.

iii. LoPresti Fails to Suggest the Imputing Variables

The Examiner also rejected Claim 1, 5, 8 and 28 stating “LoPresti discloses an imputed variable generator and imputing variable values in data sets when data is missing (See page 1, sections 1-2, and page 2, sections 1-2, wherein a data set is utilized for a study and missing data is imputed so the missing data can be replaced).”

Appellants agree that LoPresti discloses imputation of missing data in raw survey data. (See page 3, first full paragraph). In fact, as previously noted, such a data set generated by a survey appears required in the analysis provided by LoPresti in that the “responses” are split into “two groups.” *Id.* One group has missing data and the other does not. *Id.* Answers to the questions answered by both groups are compared for statistical differences to determine if the missing data is randomly distributed. (See page 2, last paragraph to page 3, first paragraph). Randomly distributed missing data may be dropped, while non random data is imputed via regression. (See page 3, second and third paragraphs).

However, the imputation of missing data in raw datasets is materially distinct from the generation of imputed variables, let alone specific variables such as a “base price variable and promotional variable” as in Claim 28. LoPresti, for all its interesting dialog regarding individuals reluctance to answer questions on sexual behavior, never touches upon anything

more that imputation or very raw data in a format not utilized in the present invention. Further, there is no mention of product pricing, promotions or sales models in LoPresti.

Thus, Base Claims 1, 5, 8 and 28 are believed allowable for at least these reasons. As such, Claims 2-4, 6-7, 9-17, 19-27 and 29-36, which depend therefrom, are likewise believed allowable for depending upon an allowable parent claim.

iv. The Equivalizing Factor is not well known

The Examiner also rejected Claims 1, 5, 8 and 28 stating that none of the prior art “expressly disclose *generating an equivalent price and an equivalized unit using an equivalizing factor.*” However, the Examiner maintained his rejection by stating that “Official notice is taken that it is old and well known to perform price analysis of a quantity of a good based on a standard unit of a good where the good can be sold in different sized quantities. Such standardized (‘equivalized’) analyses lead to more accurate analyses as costs to produce goods depends on the quantity of the good sold.”

Appellants note that the math involved to generate an “equivalizing factor” may be deemed relatively rudimentary, and is often performed to make cost comparisons. However, Appellants believe within the context of modeling sales for a product the generation of an equivalizing factor, as in Claim 28, is a novel limitation. This is due to the fact that sales models, in the prior art, are generated on a product basis. There is no place within such a model for an equivalization of the products. It is only when a demand group is generated and used to model sales that the constituents of the demand group require comparison.

Thus, an ‘equivalizing factor’ is novel in the field of sales modeling. Base Claims 1, 5, 8 and 28 are believed allowable for at least these reasons. As such, Claims 2-4, 6-7, 9-17, 19-27 and 29-36, which depend therefrom, are likewise believed allowable for depending upon an allowable parent claim.

v. Boyd Fails to Suggest creating Demand Groups

The Examiner also rejected Claims 1, 5 and 8 stating that “Boyd et al. further teaches ... creating a plurality of demand groups ... wherein at least one of the demand groups is a set of at least two substitutable products and creating a sales model for each demand group (See column 5, lines 4-16, column 6, lines 25-45, column 7, lines 25-50, column 8, lines 10-30, and 45-62, and column 15, lines 40- 64, wherein demand groups and market share is concerned, the groups centered around a product and competing product for a segment. This is modeled).” (Emphasis Added).

Boyd teaches a scenario where “elasticity at an aggregate level (or product segment group) is generated.” (See Column 5, lines 14-16). However, this aggregate is performed only if “individual product forecasts cannot be reliably generated.” (See Column 5, lines 12-14). Thus, product aggregations in Boyd are determined by available product data. In contrast, the present invention, at Claims 1 and 5, utilizes “demand groups” which are sets of “substitutable products”.

This specific and detailed grouping by substitutability has meaningful impact upon the speed and accuracy of the sales modeling being performed. Demand group level sales models provide much more robust estimates of sales despite changes in assortments and product level trends such as seasonality. The product level sales models may be combined with market share models, which are very robust in estimating relative shares and relative product-substitution elasticities. These multi-level models enable the system to effectively share information between products to generate better demand estimates. The demand group sales model may be combined with the market share model to determine very accurate product specific promotion data. See the specification as filed at page 61, lines 5-13. Thus, an arbitrary product aggregate, or an aggregate by data quality, as disclosed by Boyd, would be incompatible with the present invention.

Moreover, the demand groups of Claims 1 and 5 have error correction “based on attributes of the plurality of demand groups.” Boyd fails to suggest performing error correction on the product aggregates, let alone error correction based upon product attributes.

As such Appellants respectfully traverse the Examiner’s rejection in that Boyd fails to teach the existence of “demand groups” which are sets of “substitutable products” as in Claims 1, 5 and 8. Thus, Base Claims 1, 5 and 8 are believed allowable for at least these reasons. As such, Claims 2-4, 6-7, 9-17 and 19-27 which depend therefrom, are likewise believed allowable for depending upon an allowable parent claim.

4. REGARDING CLAIMS 20, 22 AND 24

The Examiner rejected Claims 20, 22 and 24 stating that “Boyd et al. teaches conditions from the at least one manufacturer... [and] It would have been obvious to one of ordinary skill in the art at the time of the invention to include in considerations of whether or not the manufacturer is providing competitor's their products.”

Appellants respectfully believe that Boyd does not disclose conditions from a manufacturer, as in Claims 20, 22 and 24. Further, given that Boyd fails to even suggest said conditions, Appellants likewise believe that conditions requiring “not providing a promotional event for a competitor’s product” are non-obvious.

In support of his rejection, the Examiner cited where Boyd considers utilizing “competitive information” in analysis of promotional schemes. Appellants believe mere “data identifying competitors” is distinct from, and unrelated to, manufacturer’s offers as in Claims 20, 22 and 24. As such, Appellants believe Claims 20, 22 and 24 are allowable.

5. REGARDING CLAIMS 25 AND 26

The Examiner also rejected Claims 25 and 26 stating “LoPresti discloses an imputed variable generator and imputing variable values in data sets when data is missing (See page 1,

sections 1-2, and page 2, sections 1-2, wherein a data set is utilized for a study and missing data is imputed so the missing data can be replaced).”

As discussed previously, Appellants agree that LoPresti discloses imputation of missing data in raw survey data for a psychology survey tool. (See page 3, first full paragraph). However, the imputation of missing data in raw datasets is materially distinct from the generation of imputed variables, let alone specific variables such as a “base price variable and promotional variable” as in Claims 25 and 26.

LoPresti, as previously noted, never touches upon anything more than imputation or very raw data in a format not utilized in the present invention. Further, there is no mention of product pricing, promotions or sales models in LoPresti. Thus, Claims 25 and 26 are believed allowable for at least these reasons.

6. REGARDING CLAIM 29

The Examiner also rejected Claim 29 stating that he “takes official notice that it is old and well known in operations research to use linear and non-linear constraints.”

Regardless of whether linear and non-linear constraints are well known in operations research, Appellants maintain a belief that the present invention is novel in allowing the stores to set both linear and nonlinear constraints. For example, all of the constraints listed in the disclosure of Boyd appear to be linear constraints. (See column 17, lines 10-32).

Given a lack of prior art on this limitation, or official notice directed to the specifics of a “store” providing both a linear and nonlinear constraint to a promotion event, Appellants believe Claim 29 is allowable.

7. REGARDING CLAIM 30

The Examiner also rejected Claim 30 stating that “Boyd et al. teaches: computing a score for each offer of the plurality of offers and each event of the plurality of promotional events, wherein each event include at least one type of promotional vehicle, and wherein each offer includes at least one promotional vehicle requirement (See column 1, lines 60-67, column 2, lines 8-30, column 4, lines 63-67, column 5, lines 29-35, column 7, lines 1-25, column 13, lines 1-20, wherein promotional events are both financial and non-financial events and offers are the values of these event types. See also column 15, lines 1-20. See column 11, i lines 20-35, column 21, lines 35-50, column 23, lines 20-26, which disclose vehicle considerations);.” (Emphasis Added).

Appellants respectfully traverse the Examiner’s rejection in that Boyd appears to fail to disclose “computing a score for each offer.” Moreover, the “offers” of Boyd fail to include a “promotional vehicle requirement.” Instead Boyd discloses producing a “value evaluation ... for [a] promotion.” (See Column 1, lines 60-63). This valuation is generated for the entire promotion. Nowhere in Boyd does there appear to be a score generated for the promotion event and offer separately as a step in this overall promotion valuation. Moreover, while Boyd appears to disclose the existence of manufacturer “offers”, there does not appear to be promotional vehicle requirements associated with their offers as in Claim 30. (See Column 20, lines 23-25).

As a score is not generated for the offers in Boyd, and further in view that the offers in Boyd do not appear to include “promotional vehicle requirements”, Appellants believe Claim 30 is allowable over the cited prior art.

Moreover, given that the “offers” of Boyd do not appear to include “promotional vehicle requirements”, Appellants further assert that Boyd likewise does not perform “reconciling the type of promotional vehicle with the promotional vehicle requirements for the offers and events within the subset of offers and events” as in claim 30. The Examiner, in support of his rejection, cites multiple sections of Boyd associated with the definitions to the variables in the transformed

“Attraction Model” and “Multiplicative Model”. (See Column 11, lines 20-35; Column 21, lines 35-50; and Column 23, lines 20-26).

Appellants respectfully submit that the citation of a number of variables in an equation which models responses to a promotion is dissimilar from and unrelated to “reconciling” in any form, let alone reconciling “promotional vehicle requirements” of an offer with the “promotion vehicle” of the event as in Claim 30. As such, Appellants believe Claim 30 is allowable over the cited prior art for at least these reasons.

8. REGARDING CLAIM 31

The Examiner also rejected Claim 31 stating that “Boyd et al. teaches wherein computing the score independently computes a value of each offer and a value of each event.” Appellants respectfully traverse the rejection in that there appears no suggestion in Boyd to compute a score for “each offer” **independently** from “each event” as in Claim 31.

The Examiner again cites the “Evaluation Module” of Boyd in his rejection of the claim. (See Column 13, lines 1-20). However, the accesses the entire “promotion scheme” and evaluates the promotion scheme. *Id.* As this method for evaluation is not **independently** score offers and events, as in Claim 31, the present invention is believed allowable over the cited prior art for at least these reasons.

C. CONCLUSION

In sum, Appellants believe that all pending Claims 1-17 and 19-36 are allowable over the cited art and are also in allowable form and respectfully request a Notice of Allowance for this application from the Appeal Board. The commissioner has been authorized to charge our credit card (via EFS) in the amount of \$540 (Appeal Brief fee). The commissioner is authorized to charge any additional fees that may be due or credit any overpayment to our Deposit Account No. 50-2766 (Order No. DEM1P006). Should the Appeal Board believe that a telephone conference would expedite the prosecution of this appeal; the undersigned can be reached at telephone number 925-570-8198.

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Respectfully submitted,

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VIII. LISTING OF CLAIMS APPENDIX:

What is claimed is:

1. A computerized price optimization system configured to create a promotional event calendar, useful in association with at least one store, the computerized price optimization system comprising:

an econometric engine including computer-readable code configured to model sales as a function of price to create a sales model, wherein the econometric engine includes an imputed variable generator for:

imputing base price variable and promotional variable,

creating a plurality of demand groups, wherein each demand group is a set of at least one product and wherein at least one of the demand groups is a set of at least two substitutable products, and wherein the creation of the plurality of demand groups includes error detection and correction based on attributes of the plurality of demand groups,

generating an equivalent price and an equivalized unit for each product of the plurality of demand groups using an equivalizing factor, and

wherein the sales model includes the imputed base price variable, the equivalent price, the equivalent unit and the promotional variable;

a financial model engine including computer-readable code configured to model costs to create a cost model;

a promotional engine coupled to the econometric engine, and financial model engine, the promotional engine including computer-readable code configured to receive input from the econometric engine and financial model engine, wherein the promotional engine analyzes a

plurality of offers, a plurality of promotional events, conditions from at least one manufacturer, and constraints from the at least one store to optimally match offers with promotional events to create a promotional event calendar subject to the conditions from the at least one store, and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint.

2. The system, as recited in claim 1, wherein the promotional engine further comprises a temporary price reduction optimizing engine including computer-readable code configured to temporarily reduce prices after the promotional events and offers have been selected.

3. The system, as recited in claim 2, further comprising a support tool connected to the promotional engine wherein the support tool includes computer-readable code configured to receive the promotional event calendar from the promotional engine and provides a user interface to a client, wherein the user interface provides the promotional event calendar to the client.

4. The system, as recited in claim 1, wherein the promotional engine calculates the value of offers and the value of promotional events by using the financial model and sales model and selects combinations of the offers and the promotional events.

5. A computer-implemented method for creating a promotional event calendar, comprising:
creating a plurality of demand groups, wherein each demand group is a set of at least one product and wherein at least one of the demand groups is a set of at least two substitutable products, and wherein the creation of the plurality of demand groups includes error detection and correction based on attributes of the plurality of demand groups;

generating an equivalent price and an equivalized unit for each product of the plurality of demand groups using an equivalizing factor;

creating a sales model for each demand group and wherein the sales model includes an imputed base price variable, the equivalent price, the equivalent unit and a promotional variable;

creating a cost model;

determining conditions from at least one manufacturer;

determining constraints from at least one store, and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint;

determining the value of offers using the sales model and cost model;

determining the value of promotional events using the sales model and cost model; and

selecting combinations of the offers and promotional events based on the determined values to create a promotion event calendar subject to the conditions from the at least one manufacturer and constraints from the at least one store.

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6. The computer-implemented method, as recited in claim 5, wherein the creating of the sales model further comprises:

creating a market share model for each product in each demand group.

7. The computer-implemented method, as recited in claim 6, further comprising the step of estimating net profit from the selected combination of offers and promotional events using the sales model and cost model.

8. A computer-implemented method for creating a promotional event calendar, comprising:
creating a sales model, comprising:

creating a plurality of demand groups, wherein each demand group is a set of at least one product and wherein at least one of the demand groups is a set of at least two products;

generating an equivalent price and an equivalized unit for each product of the plurality of demand groups using an equivalizing factor;

creating a sales model for each demand group and wherein the sales model for each demand group includes an imputed base price variable, the equivalent price, the equivalent unit and a promotional variable; and

creating a market share model for each product in each demand group;

creating a cost model;

determining conditions from at least one manufacturer;

determining constraints from at least one store, and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint;

determining the value of offers using the sales model and cost model;

determining the value of promotional events using the sales model and cost model;

selecting combinations of offers and promotional events based on the determined values to create a promotion event calendar subject to the conditions from the at least one manufacturer and constraints from the at least one store; and

estimating net profit from the selected combination of offers and promotional events using the sales model and cost model.

9. The system as recited in claim 1, wherein the constraints from the at least one store include at least one of ad space capacity and display space capacity.

10. The system as recited in claim 1, wherein the constraints from the at least one store include at least one of an event type, a number of events, a brand promotion frequency, and a product promotion frequency.

11. The computer-implemented method as recited in claim 5, wherein the constraints from the at least one store include at least one of ad space capacity and display space capacity.

12. The computer-implemented method as recited in claim 5, wherein the constraints from the at least one store include at least one of an event type, a number of events, a brand promotion frequency, and a product promotion frequency.

13. The computer-implemented method as recited in claim 8, wherein the constraints from the at least one store include at least one of ad space capacity and display space capacity.

14. The computer-implemented method as recited in claim 8, wherein the constraints from the at least one store include at least one of an event type, a number of events, a brand promotion frequency, and a product promotion frequency.

15. The system as recited in claim 1, wherein the matching of offers with promotional events includes solving an integer problem using the linear constraint and the nonlinear constraint.

16. The computer-implemented method as recited in claim 5, wherein the selection of combinations of offers and promotional events includes solving an integer problem using the linear constraint and the nonlinear constraint.

17. The computer-implemented method as recited in claim 8, wherein the selection of combinations of offers and promotional events includes solving an integer problem using the linear constraint and the nonlinear constraint.

18. (Cancelled)

19. The system as recited in claim 1, wherein the conditions from the at least one manufacturer include providing at least one of a promotional event and a specific amount of promotion.

20. The system as recited in claim 1, wherein the conditions from the at least one manufacturer include not providing a promotional event for a competitor's product.

21. The computer-implemented method as recited in claim 5, wherein the conditions from the at least one manufacturer include providing at least one of a promotional event and a specific amount of promotion.

22. The computer-implemented method as recited in claim 5, wherein the conditions from the at least one manufacturer include not providing a promotional event for a competitor's product.

23. The computer-implemented method as recited in claim 8, wherein the conditions from the at least one manufacturer include providing at least one of a promotional event and a specific amount of promotion.

24. The computer-implemented method as recited in claim 8, wherein the conditions from the at least one manufacturer include not providing a promotional event for a competitor's product.

25. The system as recited in claim 1, wherein the imputed base price variable is a function of initial base prices.

26. The system as recited in claim 25, wherein the initial base prices are averages of non-promoted prices.

27. The system as recited in claim 1, wherein the econometric engine utilizes Bayesian Shrinkage modeling which relies on a mixed-model methodology of combining data to dampen any extreme values of the data.

28. A computer-implemented method for creating a promotional event calendar, useful in association with at least one store, the computer-implemented method comprising:

modeling sales as a function of price to create a sales model, wherein the sales model includes imputing base price variable and promotional variable, and generating an equivalent price and an equivalized unit using an equivalizing factor;

modeling costs to create a cost model;

receiving cost model and sales model;

analyzing a plurality of offers, a plurality of promotional events, conditions from at least one manufacturer, and constraints from the at least one store; and

creating a promotional event calendar by optimally matching offers with promotional events.

29. The computer-implemented method, as recited in claim 28, wherein creating the promotional event calendar is subject to the conditions from the at least one store, and wherein the constraints from the at least one store includes a linear constraint and a nonlinear constraint.

30. The computer-implemented method, as recited in claim 29, wherein creating the promotional event calendar comprises:

computing a score for each offer of the plurality of offers and each event of the plurality of promotional events, wherein each event include at least one type of promotional vehicle, and wherein each offer includes at least one promotional vehicle requirement;

selecting a combination of offers from the plurality of offers, and events from the plurality of promotional events to form a subset of offers and events;

reconciling the type of promotional vehicle with the promotional vehicle requirements for the offers and events within the subset of offers and events; and

constructing a promotion calendar utilizing the subset of offers and events, and reconciled type of promotional vehicle and promotional vehicle requirements.

31. The computer-implemented method, as recited in claim 30, wherein the computing the score independently computes a value of each offer and a value of each event, and wherein the computing the score also links each product with one promotional vehicle type of the at least one promotional vehicle type.

32. The computer-implemented method, as recited in claim 30, wherein selecting the combination of offers and events includes maximizing the sum of the values of the offers and events within the subset of offers and events, while adhering to the conditions from at least one manufacturer and the constraints from the at least one store.

33. The computer-implemented method, as recited in claim 30, wherein reconciling the type of promotional vehicle with the promotional vehicle requirements includes solving an integer problem.

34. The computer-implemented method, as recited in claim 30, wherein constructing a promotion calendar includes setting the promotion levels of each product and computing the resulting profit over a promotional period.

35. The computer-implemented method, as recited in claim 30, wherein the selection subset of offers and events includes the integer programming model with the following objective function and appropriate restrictions on the variables:

$$\sum_{t=1}^T \sum_o Value_o IO_{o,t} + \sum_{t=1}^T \sum_e Value_{e,t} IE_{e,t}$$

where,

t : atime indices;

O : a set of offers;

o : an offer in O ;

E : a set of events;

e : an event in E ;

T : total planning period in weeks;

$IE_{e,t} \equiv \begin{cases} 1 & \text{if event } e \text{ is scheduled to start in period } t \\ 0 & \text{otherwise} \end{cases}$; and

$IO_{o,t} \equiv \begin{cases} 1 & \text{if offer } o \text{ is accepted in period } t \\ 0 & \text{otherwise} \end{cases}$.

36. The computer-implemented method, as recited in claim 30, wherein the reconciliation includes the integer programming model with the following objective function and appropriate restrictions on the variables:

$$\text{Maximize: } \sum_{t=1}^T \left(\sum_{\substack{p,e: IE_{e,t}=1 \\ k \in \text{DisplayLag}(e)}} \text{Score}_p \text{IDE}_{p,e,t+k} + \sum_{\substack{p,e: IE_{e,t}=1 \\ k \in \text{AdLag}(e)}} \text{Score}_p \text{IAE}_{p,e,t+k} \right)$$

where,

t : time indices;

E : set of events;

e : event in E ;

p : index for products belonging to a set of promoted products;

$\text{DisplayLag}(e) \equiv \left\{ \begin{array}{l} \text{the offsets from the start of the event during} \\ \text{which the products have to be on display} \end{array} \right\};$

$\text{AdLag}(e) \equiv \left\{ \begin{array}{l} \text{the offsets from the start of the event during} \\ \text{which the products have to be advertised.} \end{array} \right\};$

T : total planning period in weeks;

$IE_{e,t} \equiv \begin{cases} 1 & \text{if event } e \text{ is scheduled to start in period } t \\ 0 & \text{otherwise} \end{cases};$

$\text{IDE}_{p,e,r} \equiv \begin{cases} 1 & \text{if product } p \text{ is on display in event } e \text{ in period } r \\ 0 & \text{otherwise} \end{cases};$

$\text{IAE}_{p,e,r} \equiv \begin{cases} 1 & \text{if product } p \text{ is advertised in event } e \text{ in time } r \\ 0 & \text{otherwise} \end{cases};$ and

r : any period in the promotion interval.

IX. EVIDENCE APPENDIX

none

X. RELATED PROCEEDINGS APPENDIX

none